

Abstract

The aim of this research paper is to evaluate the chest compression rate (CCR) from the bottom-up view using a smartphone placed flat on the floor facing upwards. The CCR is to be evaluated in real-time during cardiopulmonary resuscitation (CPR) as a proof-of-concept for the CPR Assistant project.

Out-of-hospital cardiac arrest (OHCA) is a leading cause of mortality globally, with more than 350,000 incidents annually in the United States alone, and a low survival rate of 12%. CPR performed by bystanders has been found to increase rates of survival to one month for victims of OHCA. The rate of bystander CPR can be improved globally, and tools to aid bystander CPR must be made conveniently available. Metrics such as the CCR and the chest compression depth (CCD) are vital metrics for applying quality CPR.

This research paper explores the different aspects of CPR and the recommended procedures. Investigation and analysis is also performed on existing methods of evaluating the CCR, outlining performance and the drawbacks that these solutions incur. This critical analysis justifies the goal of this research paper.

Evaluation of the CCR was performed by developing an algorithm that employs computer vision techniques. This algorithm uses the acceleration of pixels in real-time to detect chest compressions. Artificial ventilation is also detected using the displacement of pixels as a secondary objective.

The algorithm is robust and performs well, detecting 88% of chest compressions and 69% of artificial ventilations in a mixture ideal and non-ideal test environments. This is suitable for use in training scenarios, but must be further refined to realise its full potential. Methods to achieve this are also outlined.